

APPLICATION
FOR
UNITED STATES LETTERS PATENT

TITLE: *Rotatable* ~~SHEET FEEDER AND SHEET TRAY~~

APPLICANTS: Chiharu MATSUKAWA

"EXPRESS MAIL" Mailing Label Number: EL890178071US
Date of Deposit: November 8, 2001



22511

PATENT TRADEMARK OFFICE

1000666 1000666

10/008688
AGW
FEB 14 2002

Rotatable Sheet Tray

~~SHEET FEEDER AND SHEET TRAY~~

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention generally relates to a sheet feeder and to a sheet tray. More particularly, the present invention relates to a sheet feeder having a sheet tray body enabled to be accommodated in a sheet feeder body, and to a sheet tray having such a tray body.

2. Description of the Related Art

Hitherto, sheet feeders each having a sheet tray enabled to be accommodated in a sheet feeder body have been known as sheet feeders for use in printers, plotters, and electronic copying machines. Such sheet feeders each having a sheet tray enabled to be accommodated in a sheet feeder body are disclosed in, for example, JP-A-8-81092, JP-B-6-71950, and JP-A-11-199101. Hereinafter, an ink jet printer is described as an example of conventional equipment having such a sheet feeder.

FIG. 10 is a perspective view illustrating a conventional ink jet printer having drawer type sheet trays. FIG. 11 is a sectional side view, taken from the right of FIG. 10, illustrating a condition (that is, a used condition of the sheet tray), in which the sheet trays are drawn out of the conventional ink jet printer. FIG. 12 is a sectional side

10008688-10001

view illustrating an accommodated condition (that is, an unused condition of the sheet tray), in which the sheet trays are accommodated in the conventional ink jet printer.

First, an outline of the configuration of the ink jet printer having the conventional drawer type trays 105 and 106 is described hereinbelow by referring to FIGS. 10 to 12. The conventional ink jet printer has a bottom cover 101, a back cover 102 disposed on the rear surface thereof, and a front cover 103 disposed on the front surface thereof, as shown in FIGS. 11 and 12. A sheet mounting portion 104 is provided on the bottom cover 101. The bottom cover 101, the back cover 102, and the front cover 103 cover a motor (not shown) for driving a printer engine portion and other constituent elements of the printer. Further, as shown in FIG. 10, sheet guide portions 107a and 107b are provided on the sheet mounting portion 104. The sheet guide portion 107a is fixed to the sheet mounting portion 104. Moreover, the sheet guide portion 107b is attached to the sheet mounting portion 104 in such a manner as to be able to move in a transverse direction according to a sheet size.

Next, the details of the configuration of each of the conventional drawer type sheet trays 105 and 106 are described hereinbelow by referring to FIGS. 10 to 12. The conventional drawer type sheet tray 105 is mounted on the rear surface of the sheet mounting portion 104 in such a fashion as to be able

affects paper feeding.

SUMMARY OF THE INVENTION

The invention is accomplished to solve the aforementioned problem. Accordingly, an object of the invention is to provide a sheet feeder enabled to alleviate a difference in sheet-mounting-surface level between a sheet mounting surface of the sheet tray and that of the sheet mounting portion of a sheet feeder body in the connection portion, in which the sheet tray and the sheet mounting portion are connected to each other, and to provide a sheet tray having such a sheet tray body.

To achieve the foregoing object, according to an aspect of the invention, there is provided a sheet feeder (hereunder referred to as a first sheet feeder) that comprises a sheet tray body disposed in such a way as to be able to rotate around a shaft, which is provided in such a manner as to be nearly perpendicular to a sheet mounting surface thereof and enabled to be accommodated in a sheet feeder body, a step-like part provided in the sheet tray body in such a fashion as to be placed in a connection portion, in which the sheet tray body and an upper edge part of a sheet mounting portion of the sheet feeder body are connected to each other, when the sheet tray body is used, and a thrusting member for frontwardly pushing the sheet tray when the sheet tray is used.

According to the first sheet feeder of the invention, as described above, the difference in sheet-mounting-surface level between the sheet mounting surface of the sheet tray body and that of the sheet feeder body at the time of using the sheet tray body is alleviated by providing the step-like part in the sheet tray body in such a way as to be placed in the connection portion, in which the upper edge part of the sheet mounting portion of the sheet feeder body and the sheet tray body are connected to each other, when the sheet tray body is used. This mitigates the inconvenience that a sheet of paper is caught by the step-like part during paper feeding. Moreover, the sheet tray body is easily placed in a position, in which the sheet tray body is enabled so that the difference in sheet-mounting-surface level between the sheet mounting surface of the sheet tray body and that of the sheet feeder body at the time of using the sheet tray body is alleviated, by providing the thrusting member, which is operative to frontwardly push the sheet tray body when the sheet tray body is used, in the sheet tray body. Incidentally, the sheet tray body is disposed in such a way as to be able to turn around the shaft provided in such a manner as to be nearly perpendicular to the sheet mounting surface thereof. Consequently, the sheet tray body is easily drawn out when the sheet tray body is used, and accommodated when the sheet tray body is not used, by laterally turning the sheet tray body.

According to an embodiment (hereunder referred to as a second sheet feeder) of the first sheet feeder of the invention, the thrusting member includes an abutting rib, provided on a rear surface of the sheet tray body in such a manner as to be integral with the sheet tray body, for frontwardly pushing the sheet tray body by abutting against the sheet feeder body as the sheet tray body turns.

According to the second sheet feeder of the invention, as described above, an abutting rib serving as the thrusting member for frontwardly pushing the sheet tray body by abutting against the sheet feeder body with turning the sheet tray body is provided on the rear surface of the sheet tray body in such a manner as to be integral with the sheet tray body. Thus, the second sheet feeder has an advantageous effect in that the number of components and the number of man-hours needed for fabricating the sheet feeder remain unincreased even when the abutting rib serving as the thrusting member is added to the sheet feeder.

According to an embodiment (hereunder referred to as a third sheet feeder) of the first or second sheet feeder of the invention, the upper edge part of the sheet feeder body has a tapered shape.

According to the third sheet feeder of the invention, as described above, the difference in sheet-mounting-surface level between the sheet mounting surface of the sheet tray

body and that of the sheet feeder body at the time of using the sheet tray body is alleviated by forming the upper edge part of the sheet mounting portion of the sheet feeder body in such a way as to have a tapered shape. Consequently, the difference in sheet-mounting-surface level between the sheet mounting surface of the sheet tray body and that of the sheet feeder body at the time of using the sheet tray body is more effectively alleviated by utilizing both the step-like part of the sheet tray body of the first sheet feeder of the invention and the tapered upper edge part of the sheet mounting portion of the sheet feeder body. The third sheet feeder more effectively mitigates the inconvenience that a sheet of paper is caught by the step-like part during paper feeding.

To achieve the foregoing object, according to another aspect of the invention, there is provided a sheet tray that comprises a sheet tray body disposed in such a way as to be able to rotate around a shaft, which is provided in such a manner as to be nearly perpendicular to a sheet mounting surface, and enabled to be accommodated in a sheet feeder body, a step-like part provided in the sheet tray body in such a fashion as to be placed in a connection portion, in which the sheet tray body and an upper edge part of a sheet mounting portion of the sheet feeder body are connected to each other, when the sheet tray body is used, and a thrusting member for frontwardly pushing the sheet tray body when the sheet tray

body is used.

According to this sheet tray of the invention, as described above, the difference in sheet-mounting-surface level between the sheet mounting surface of the sheet tray body and that of the sheet feeder body at the time of using the sheet tray body is alleviated by providing the step-like part in the sheet tray body in such a way as to be placed in the connection portion, in which the upper edge part of the sheet mounting portion of the sheet feeder body and the sheet tray body are connected to each other, when the sheet tray body is used. This sheet tray mitigates the inconvenience that a sheet of paper is caught by the step-like part during paper feeding. Moreover, the sheet tray body is easily placed in a position, in which the sheet tray body is enabled so that the difference in sheet-mounting-surface level between the sheet mounting surface of the sheet tray body and that of the sheet feeder body at the time of using the sheet tray body is alleviated, by providing the thrusting member, which is operative to frontwardly push the sheet tray body when the sheet tray body is used, in the sheet tray body. Incidentally, the sheet tray body is disposed in such a way as to be able to turn around the shaft provided in such a manner as to be nearly perpendicular to the sheet mounting surface thereof. Consequently, the sheet tray body is easily drawn out when the sheet tray body is used, and accommodated when the sheet

tray body is not used, by laterally turning the sheet tray body.

To achieve the foregoing object, according to another aspect of the invention, there is provided a sheet feeder (hereunder referred to as a fourth sheet feeder) that comprises a sheet tray body rotatably provided and enabled to be accommodated in a sheet feeder body, a step-like part provided in the sheet tray body in such a fashion as to be placed in a connection portion, in which the sheet tray body and an upper edge part of a sheet mounting portion of the sheet feeder body are connected to each other, when the sheet tray body is used, and a thrusting member for frontwardly pushing the sheet tray body when the sheet tray body is used.

According to the fourth sheet feeder of the invention, as described above, the difference in sheet-mounting-surface level between the sheet mounting surface of the sheet tray body and that of the sheet feeder body at the time of using the sheet tray body is alleviated by providing the step-like part in the sheet tray body in such a way as to be placed in the connection portion, in which the upper edge part of the sheet mounting portion of the sheet feeder body and the sheet tray body are connected to each other, when the sheet tray body is used. The fourth sheet feeder mitigates the inconvenience that a sheet of paper is caught by the step-like part during paper feeding. Moreover, the sheet tray body is

10003688 110801

easily placed in a position, in which the sheet tray body is enabled so that the difference in sheet-mounting-surface level between the sheet mounting surface of the sheet tray body and that of the sheet feeder body at the time of using the sheet tray body is alleviated, by providing the thrusting member, which is used for frontwardly pushing the sheet tray body when the sheet tray body is used, in the sheet tray body. Incidentally, the sheet tray body is disposed in such a way as to be able to turn around the shaft provided in such a manner as to be nearly perpendicular to the sheet mounting surface thereof. Consequently, the sheet tray body is easily drawn out when the sheet tray body is used, and accommodated when the sheet tray body is not used, by laterally turning the sheet tray body.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view illustrating a condition (that is, a used condition of a sheet tray), in which a sheet tray is drawn out of an ink jet printer having the sheet tray according to a first embodiment of the invention;

FIG. 2 is a sectional side view illustrating the ink jet printer according to the first embodiment of the invention shown in FIG. 1, and taken from the right side thereof, as viewed in FIG. 1;

FIG. 3 is a partially sectional view illustrating the

printer shown in FIG. 1, and taken from the rear side thereof, as viewed in FIG. 1. FIG. 4 is an enlarged sectional side view illustrating a connection portion in which a sheet tray and a sheet mounting portion shown in FIG. 2 are connected to each other.

First, an outline of the configuration of an ink jet printer according to a first embodiment of the invention is described hereinbelow by referring to FIGS. 1 to 2. The ink jet printer of the first embodiment has a bottom cover 2, a back cover 3 disposed on the rear surface thereof, and a front cover 1 disposed on the front surface thereof, as shown in FIG. 2. A sheet mounting portion 4 is provided on the bottom cover 2. The bottom cover 2, the back cover 3, and the front cover 1 cover a motor (not shown) for driving a printer engine portion and other constituent elements of the printer. Further, as shown in FIG. 1, a sheet setting opening 6 is provided between the front cover 1 and the sheet mounting portion 4. Furthermore, a sheet guide portion 5 is provided on the sheet mounting portion 4 in such a manner as to be able to move in a transverse direction according to a sheet size.

Next, the details of the configuration of a sheet tray of the sheet feeder according to the first embodiment are described hereinbelow by referring to FIGS. 1 to 4. In the sheet feeder of the first embodiment, a sheet tray 10 is supported on a shaft 12, which is provided in such a way as

to extend in a direction perpendicular to a sheet mounting surface, in such a manner as to be able to laterally turn therearound, as illustrated in FIGS. 2 and 3. This shaft 12 is provided on the rear surface of the sheet mounting portion 4 in such a way as to be integral therewith. Moreover, a sheet guide portion 11 is provided on the sheet tray 10, as illustrated in FIG. 1. The sheet guide portion 11 is formed in such a way as to be integral with the sheet tray 10.

Incidentally, in the first embodiment, a step-like part 10a is provided in the sheet tray 10, as illustrated in FIG. 4. This step-like part 10a is provided in such a way as to be placed in a connection portion, in which the upper edge part 4a of the sheet mounting portion 4 and the sheet tray 10 are connected to each other, when the sheet tray 10 is used. Further, as shown in FIG. 4, the upper edge part 4a of the sheet mounting portion 4 of the sheet feeder is formed in such a manner as to have a tapered shape. Furthermore, as illustrated in FIGS. 2 and 3, an abutting rib 13 for frontwardly pushing the sheet tray 10 at the time of using the sheet tray 10 is provided on the rear surface of the sheet tray 10. This abutting rib 13 is formed in such a way as to be integral with the sheet tray 10. Incidentally, the abutting rib 13 corresponds to the "thrusting member" of the invention.

FIG. 5 is a perspective view illustrating a condition in which the sheet tray is accommodated in the ink jet printer

having the sheet tray according to the first embodiment. FIG. 6 is a sectional side view illustrating the ink jet printer shown in FIG. 5, and taken from the right side thereof, as viewed in FIG. 5. FIG. 7 is a sectional side view illustrating the ink jet printer shown in FIG. 5, and taken from the rear side thereof, as viewed in FIG. 5.

Next, an operation of changing the condition of the sheet tray of the first embodiment of the invention from the accommodated condition to the used condition by referring to FIGS. 1 to 7.

First, in the accommodated condition, the sheet tray 10 is accommodated in a space provided between the rear surface of the sheet mounting portion 4 of the sheet feeder and the back cover 3, as shown in FIG. 6. When the sheet tray 10 is used, first, the sheet tray 10 is drawn out therefrom. At that time, the sheet tray 10 is drawn out therefrom by laterally turning the sheet tray 10 around the shaft 12. Further, as shown in FIG. 2, when the sheet tray 10 is drawn out therefrom, the abutting rib 13 provided on the rear surface of the sheet tray 10 is caused to abut against an upper portion of the inner surface of the back cover 3. Thus, the sheet tray 10 is frontwardly pushed out. Consequently, as shown in FIG. 4, the step-like part 10a provided in the sheet tray 10 is pushed out onto the top surface of the upper edge 4a of the sheet mounting portion 4.

In the first embodiment, as described above, the step-like part 10a is provided in the sheet tray 10 in such a manner as to be placed in a connection portion, in which the sheet tray 10 and the upper edge portion 4 of the sheet mounting portion 4 of the sheet feeder body are connected to each other, when the sheet tray 10 is used. This alleviates the difference in sheet-mounting-surface level between the sheet mounting surface 10b of the sheet tray 10 and that 4b of the sheet mounting portion 4 of the sheet feeder, which is caused in the connection portion wherein the sheet tray 10 and the sheet mounting portion 4 are connected to each other. Consequently, this mitigates the inconvenience that a sheet of paper is caught by a step-like part, which is provided in the sheet tray, when the sheet of paper is put on the sheet mounting surface 10b of the sheet tray 10 and the sheet mounting surface 4b of the sheet mounting portion 4.

Furthermore, in the first embodiment, as described above, the upper edge part 4a of the sheet mounting surface 4b of the sheet feeder body is formed in such a way as to have a tapered shape. Thus, as illustrated in FIG. 4, the difference in sheet-mounting-surface level between the sheet mounting surface 10b of the sheet tray 10 and the upper edge part 4a of the sheet mounting surface 4b of the sheet mounting portion 4, which is caused in the connection portion wherein the sheet tray 10 and the sheet mounting portion 4 are connected to each

other, is alleviated. Consequently, this embodiment mitigates the inconvenience that a sheet of paper is caught by a step-like part, which is provided in the sheet tray, when the sheet of paper is put on the sheet mounting surface 10b of the sheet tray 10 and the sheet mounting surface 4b of the sheet mounting portion 4. That is, the first embodiment utilizes both the step-like part 10a of the sheet tray 10 and the tapered upper edge part 4a of the sheet mounting portion 4 to thereby effectively prevent a sheet of paper from being caught by the step-like part in the connection portion in which the sheet tray 10 and the sheet mounting portion 4 are connected to each other.

Furthermore, the first embodiment has the abutting rib 13 that is provided on the rear surface of the sheet tray 10 and that is operative to frontwardly push the sheet tray 10 by abutting against the back cover 3. Thus, when the sheet tray 10 is used, the step-like part 10a of the sheet tray 10 is easily pushed out onto the top surface of the upper edge part 4a of the sheet mounting portion 4. Consequently, the sheet tray 10 is easily placed in a suitable position in such a way as to alleviate the difference in sheet-mounting-surface level between the sheet mounting surface 10b of the sheet tray 10 and the sheet mounting surface 4b of the sheet mounting portion 4, which is caused in the connection portion wherein the sheet tray 10 and the sheet mounting portion 4 are connected

to each other. Moreover, the abutting rib 13 is provided in such a manner as to be integral with the sheet tray 10. Consequently, the first embodiment has an advantageous effect in that the number of components and the number of man-hours needed for fabricating the sheet feeder remain unincreased even when the abutting rib 13 is added to the sheet feeder.

Further, in the first embodiment, the sheet tray 10 is disposed in such a way as to be able to turn around the shaft 12 provided in such a manner as to be nearly perpendicular to the sheet mounting surface thereof. Moreover, the sheet tray 10 is provided in such a way as to be able to be accommodated in the space between the sheet mounting portion 4 provided in the sheet feeder body and the back cover 3. Consequently, the sheet tray 10 is easily drawn out when the sheet tray body is used, and accommodated when the sheet tray body is not used, by laterally turning the sheet tray 10.

Second Embodiment

FIG. 8 is a sectional side view illustrating a condition (that is, a used condition), in which a sheet tray is drawn out of an ink jet printer having the sheet tray according to a second embodiment of the invention. FIG. 9 is an enlarged sectional side view illustrating a connection portion, in which a sheet tray and a sheet mounting portion shown in FIG. 8 are connected to each other.

The details of the configuration of a sheet tray 20

according to a second embodiment of the invention are described hereinbelow with reference to FIGS. 8 and 9. As shown in FIG. 8, the sheet tray 20 of the second embodiment is supported on the shaft 12, which is provided in such a way as to extend in a direction perpendicular to the sheet mounting surface, in such a manner as to be able to laterally turn, similarly as the sheet tray of the first embodiment. Further, the sheet tray 20 is disposed in such a manner as to be able to be accommodated in the space that is provided between the rear surface of the sheet mounting portion 4 provided in the sheet feeder body and the back cover 3. Further, a sheet guide portion 21 is provided in the sheet tray 20, similarly as the first embodiment. The sheet guide portion 21 is formed in such a way as to be integral with the sheet tray 20. Moreover, as illustrated in FIG. 9, the sheet tray 20 consists of the step-like part 20a and the sheet mounting surface 20b. This step-like part 20a is provided in such a manner as to be placed in the connection portion, in which the sheet tray 20 and the upper edge part 4a of the sheet mounting portion 4 are connected to each other, similarly as the step-like part of the first embodiment.

Further, as shown in FIG. 8, the abutting rib 23 is provided on the rear surface of the sheet tray 20. The abutting rib 23 is formed in such a manner as to be integral with the sheet tray 20, similarly as the abutting rib of the first embodiment.

embodiment.

Further, in the second embodiment, the upper edge part 4a of the sheet mounting portion 4 is formed in such a way as to have a tapered shape, similarly as the upper edge part in the first embodiment. Thus, the second embodiment alleviates the difference in sheet-mounting-surface level between the sheet-mounting-surface of the sheet tray 20 and that of the upper edge part 4a of the sheet tray 20 in the connection portion in which the sheet tray 20 and the upper edge part 4a are connected to each other. Consequently, the second embodiment mitigates the inconvenience that a sheet of paper is caught by the step-like part during paper feeding.

Furthermore, similarly as the first embodiment, the second embodiment has an abutting rib 23 that is provided on the rear surface of the sheet tray 20 and that is operative to frontwardly push the sheet tray 20 by abutting against an upper part of the inner surface of the back cover 3. Thus, when the sheet tray 20 is used, the step-like part 20a of the sheet tray 20 is easily pushed out onto the top surface of the upper edge part 4a of the sheet mounting portion 4. Consequently, the sheet tray 20 is easily placed in a suitable position in such a way as to alleviate the difference in sheet-mounting-surface level between the sheet mounting surface 20b of the sheet tray 20 and the sheet mounting surface 4b of the sheet mounting portion 4, which is caused in the

connection portion wherein the sheet tray 20 and the sheet mounting portion 4 are connected to each other. Moreover, the abutting rib 23 is provided in such a manner as to be integral with the sheet tray 20. Consequently, the second embodiment has an advantageous effect in that the number of components and the number of man-hours needed for fabricating the sheet feeder remain unincreased even when the abutting rib 23 is added to the sheet feeder.

Further, in the first embodiment, the sheet tray 20 is disposed in such a way as to be able to turn around the shaft 12 provided in such a manner as to be nearly perpendicular to the sheet mounting surface thereof, similarly as the sheet tray in the first embodiment. Moreover, the sheet tray 20 is provided in such a way as to be able to be accommodated in the space between the sheet mounting portion 4 provided in the sheet feeder body and the back cover 3. Consequently, the sheet tray 20 is easily drawn out when the sheet tray body is used, and accommodated when the sheet tray body is not used, by laterally turning the sheet tray 10.

Incidentally, it should be considered that the embodiments disclosed herein are illustrative in every respect, and that the invention is not limited thereto. The scope of the invention is determined by the appended claims, instead of the foregoing description of the embodiments. Further, all modifications and equivalents, which may occur to those

skilled in the art, are considered to be within the scope of the invention.

For example, although the step-like part 20a to be provided in the sheet tray 20 is formed in the second embodiment so that the sheet mounting surface 4b of the sheet mounting portion 4 is nearly flush with the sheet mounting surface 20b of the sheet tray 20, the sheet tray of the invention is not limited thereto. Even when the step-like part 20b is formed so that the sheet mounting surface 20b of the sheet tray 20 is higher than the sheet mounting surface 4b of the sheet mounting portion 4, similar effects are obtained.

As described above, the invention can provide a sheet feeder and a sheet tray, which are enabled to mitigate a difference in sheet-mounting-surface level between a sheet mounting surface of a sheet tray body and that of a sheet mounting portion of a feeder body in a connection portion in which the sheet tray body and the sheet mounting portion are connected to each other.